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Mainstreaming climate adaptation into sectoral policies in Central Africa: Insights from Cameroun

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ABSTRACT

While considerable advances have been made in mainstreaming climate adaptation into sectoral policies in most regions across Africa, little is known about Central Africa (CA) even though the sub-region has enormous potentials to mitigate greenhouse gas emissions through the Congo basin forest. This paper presents an in-depth analysis of the progress made in mainstreaming climate adaptation into sectoral policies in CA based on insights from Cameroun. To achieve this, 30 strategic policy documents published by the government of Cameroun covering different aspects of climate adaptation were exploited. Additional information was obtained from interviews with 27 stakeholders working in relevant government ministries/institutions and international organizations. Results show that significant progress has been made to mainstream climate adaptation into the forestry and energy sectors. This has been facilitated by the putting in place of national policies that consider climate change impacts and mitigation/adaptation in these sectors. Meanwhile, little progress has been recorded in the water and agricultural. The lack of progress in these sectors can be attributed to the absence of national policies that take into account climate change impacts in these sectors. Overall results show that the National Adaptation Plan of Action has played a key role in enhancing the mainstreaming of climate adaptation into sectoral policies in Cameroun. Notwithstanding the progress recorded, many obstacles such as the lack of human and financial resources still exist. Stakeholders proposed a series of potentially useful solutions to tackling obstacles hindering cross-sectoral mainstreaming initiatives. This paper contributes to contemporary debates on the extent to which adaptation mainstreaming is happening at national level in sub-Saharan Africa, and reveals the obstacles that need to be addressed in order to sustain this initiative in CA and other regions of the continent.

1. Introduction

The challenge of adapting to climate change and variability is not new given that people and communities have lived with climate variability for a long time, and have developed management decisions to cope with it (Berrang-Ford et al., 2011). However, the ways in which societies have adapted to date, and the range of adaptation mechanisms, may not be sufficient to deal with the new challenges posed by climate change such as increased extreme flood events (Levine et al., 2011). Societies most vulnerable to climate change are also those that are very sensitive to climate perturbations and least able to adapt to a changing climate and other stressors including development pressures (Levine et al., 2011).

While there is still uncertainty on the magnitude of climate change, there is high confidence that the global climate is changing (Dessai et al., 2013). Therefore, better informed and more drastic sequences of adaptation measures may be needed to substantially improve the living conditions of communities. In fact, the need to adapt to climate change is now widely recognised as evidence of its impacts on social and natural systems keep increasing and greenhouse gas (GHGs) emissions continue unabated (Wise et al., 2014). This has brought climate change adaptation to the forefront of most scientific enquiries and sectoral policy negotiations (Tchakert and Dietrich, 2010; Dessai et al., 2013; Ampaire et al., 2017; Epule et al., 2017; Okpara et al., 2018).

The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects which moderates harm or exploits beneficial opportunities” (IPCC, 2007, p. 869). The urgency associated with adaptation is how it can be facilitated, supported, planned and sustained.

Although sectoral adaptation planning may be constrained by uncertainties inherent in both climatic and non-climatic drivers, the

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timing of impacts and their spatial distribution and adaptation plans will generally be accepted if society can benefit from such plans, including the reduction of climate impacts (Wilby et al., 2010). There are many scales and actors involved in sectoral adaptation processes ranging from individuals in response to climate extremes to governments on behalf of society, sometimes in anticipation of change or in response to a socio-natural hazard. Adaptation therefore involves the interdependence of agents through their relationships with each other, with the institutions in which they reside, and with the resource base on which they depend (Adger, 2003). Institutions play a key role in climate adaptation because understanding the institutional dimensions of climate change adaptation is crucial to mainstreaming climate adaptation into sectoral policies (Cuevas, 2018).

To meet the challenges of promoting inclusive and sustainable development while adapting to the impacts of climate change and mitigating against further warming in line with the Paris Agreement and the Sustainable Development Goals (SDGs), there is a need to mainstream climate adaptation into all sectors and institutions/organs of government (England et al., 2018). This is especially so in regions where people, communities and sectors face the greatest climate-related threats (Millennium Ecosystem Assessment (MEA, 2005) under conditions of institutional weaknesses (Jones et al., 2009).

Whilst considerable progress has been made in mainstreaming climate adaptation into sectoral policies in East and West Africa (Lauer and Eguavoen, 2016; Alhassan and Hadwen, 2017; Ampaire et al., 2017; Pardoe et al., 2017), little is known about the Central Africa (CA) sub-region (i.e. Cameroun, Central Africa Republic, Chad, Equatorial Guinea, Gabon, Congo, Democratic Republic of Congo). Paradoxically, this sub-region is home to the Congo basin forest, which is the second largest rain forest in the world after the Amazon (Tiani et al., 2015; Bele et al., 2011). A recent study has revealed that the Congo basin harbors the most extensive tropical peatland complex at ca. 145,500 km^2 with an estimated 30.6 Petagram (Pg) of carbon stored in these peatlands (Dargie et al., 2017). The sub-region offers enormous potentials for global initiatives to mitigate climate change through different forest conservation initiatives and also to improve the livelihoods of people living in and around the Congo basin (Brown et al., 2011; Dargie et al., 2018). However, the state of climate adaptation in the sub-region is not known; and Ludwig et al. (2014) reported that out of 517 peer reviewed articles published on regional climate adaptation initiatives in Africa, only 14 covered countries in this sub-region.

2. Theoretical framework

Mainstreaming involves the articulation of information, policies and measures into ongoing development planning and decision-making to address climate change; considering that it is easier to start with existing policies and practices, rather than creating new ones (Lebel et al., 2012; Ayers et al., 2014). Through this concept, climate risks can be easily incorporated into policy and practice to support short and long-term development planning. The mainstreaming concept is not new given that it has been used to address other global issues such as gender inequality, poverty alleviation, millennium development goals, and HIV/AIDS (Kabeer, 2003; Lebel et al., 2012). The concept is widely used in climate adaptation is because climate change is a cross-sectoral challenge that poses significant risk to many development sectors and hence cannot be addressed in isolation (Vincent and Colenbrander, 2018).

There are many benefits that can be derived from mainstreaming climate adaptation into sectoral policies such as; increasing coherence and synergies across different sectors to achieve adaptation goals, reducing duplication and cost of “adaptation” implementation, and minimizing the degree to which adaptation policies contradict each other (Alhassan and Hadwen, 2017). The concept has been applied to address climate adaptation in different sectors such as disaster management (Heazle et al., 2013), development issues (Sietz et al., 2011; Ayers et al., 2014; Lauer and Eguavoen, 2016), integrated water resources management (He, 2013), and water and sanitation development planning (Alhassan and Hadwen, 2017). The wide application of the mainstreaming concept in climate adaptation in different sectors therefore provides an opportunity to examine to what extent climate adaptation has been mainstreamed into the water, agriculture, forestry and energy sectors in the CA sub-region and how it can be enhanced.

This paper addresses the following questions: (i) to what extent has climate adaptation been mainstreamed into sectoral policies; (ii) what are the constraints impeding adaptation mainstreaming; (iii) what steps are needed to address inherent constraints/obstacles in order to facilitate adaptation mainstreaming across sectoral policies. This article contributes to existing studies (focusing on adaptation mainstreaming) by highlighting the progress made by the government of Cameroun and the challenges that need to be addressed to support climate adaptation mainstreaming into different sectoral policies. Furthermore, through this kind of analysis important lessons can be learnt for informing future research on adaptation mainstreaming in the other countries of CA sub-region and beyond.

3. Methodology

3.1. Study area

The Republic of Cameroun (Fig. 1) is a democratic country situated in the Gulf of Guinea between West and Central Africa and stretches to Lake Chad. It is bounded on the West by Nigeria, on the North East by Chad, on the East by Central Africa Republic and by Gabon, Equatorial Guinea, and Republic of Congo in the South. The country has a total surface area of about 475,650 km^2 (Alemagi et al., 2014).

Monsoon circulation is the main source of rainfall in Cameroon with the coastal areas receiving the highest amount of rainfall with annual totals sometimes above 3850 mm/year while the northern part receives the lowest amount of rainfall ranging between 600–1500 mm/year (UNDP, 2010). There are four main agro-ecological zones in Cameroun (Sudano-Sahel, Savanna, Coastal and Maritime, and Forest) (UNDP, 2010). Agriculture is the backbone of country’s economy, accounting for about 41% of its Gross Domestic Product (GDP) (World Bank, 2007) and employing more than 55% of the workforce (World Resources Institute (WRI, 2007). It is mostly rain-fed thus exposing this sector to climate variability and risks of future climatic changes.

Fig. 1. Map of Africa showing the location of Cameroon.

According to Ayonghe (2001) temperatures have increased in Cameroon since the 1930s with a net increase of 0.95 °C between 1930 and 1999. Although it is projected that temperatures will continue to rise across the country due to climate change, there is no consensus among climate models on the projected mean annual rainfall in Cameroon, however, heavy precipitation events are expected to increase (Crawford et al., 2011). There is therefore need to fast-track the mainstreaming of climate adaptation into sectoral policies so that the risk pose by climate change and variability can be reduced to a minimum while exploring other opportunities that could arise from this change.

In this study, water resources, agriculture, forestry and the energy sectors were selected to examine to what extent climate adaptation has been mainstreamed in these sectors based on the following reasons: Firstly, previous studies in the sub-region have revealed that water resources in the region are very vulnerable to climate change especially in the Sudano-sahel areas (Nkiaka et al., 2017a,b; Nkiaka et al., 2018). Due to this vulnerability, many researchers have advocated that climate adaptation should be mainstreamed into water governance at the sub-regional level (Okpara et al., 2018). Secondly, like the rest of Africa, agriculture is the primary sector that supports the livelihoods of millions of people in the sub-region and it is mostly rain-fed thus, exposing it to the vagaries of weather and climate change (Sultan and Gaetani, 2016). Furthermore, it has been argued that the agricultural sector holds the key to achieving the SDGs including mitigation agendas in fragile regions (England et al., 2018). Thirdly, the sub-region's energy sector has great potentials for hydropower development in the continent with an overall potential of 133 GW (Kenfack et al., 2017). Even though hydropower plays an important role in climate change mitigation through the reduction of greenhouse gas emissions, it is also very vulnerable to climate change (Wang et al., 2014; Berga, 2016). Lastly, the sub-region's forestry sector offers enormous potentials for global initiatives to mitigate climate change through different forest conservation schemes in the Congo basin (Brown et al., 2011; Dargie et al., 2018).

Cameroun was selected as the case study for this research because a number of adaptation initiatives have been reported in Cameroun and the country has also benefitted from some adaptation finances (UNDP, 2010; Ford et al., 2010; Nachmany et al., 2015). In addition the country has the highest number of published peer reviewed articles relating to climate adaption compared to other countries of the sub-region (Ludwig et al., 2014), offering the opportunity to explore a broad base literature on the theme of this study. More so, over the years Cameroun has earned the reputation of being a "laboratory" for institutional reforms in Central Africa (Atyi et al., 2013).

3.2. Research method

The research strategy adopted in this study was an in-depth qualitative method involving the analysis of strategic policy documents published by the Government of Cameroun; complemented by semi-structured interviews with key stakeholders in relevant government ministries/institutions and organizations working in partnership with Cameroun to mainstream climate adaptation into sectoral policies.

Analysis seeks to ascertain whether mainstreaming climate adaptation was considered in the strategic policy documents published by the government in the water, agriculture, forestry and energy sectors aimed at addressing climate change. Mainstreaming is considered to occur when (i) climate change adaptation/mitigation is mentioned in the policy document(s); and (ii) specific actions are included to account for and enable the mainstreaming of climate adaptation. In this study, sectoral policy refers to any initiatives or projects put in place by government aimed at mainstreaming climate adaptation in water, agriculture; or mitigation goals in the forestry and energy sectors. Policy documents highlighting sector-specific initiatives or projects put in place through the technical assistance of development partners (e.g. World Bank, United Nations Development Program, World Conservation Union, and Global Water Partnership) aimed at addressing climate change were also consulted.

Document analysis followed a systematic procedure with focus to examine how climate adaptation/mitigation has been mainstreamed into sectoral policies since 1994 after the country ratified the United Nations Framework Convention on Climate Change (UNFCCC). Systematic procedure employed consists of searching and synthesizing research evidence on the state of knowledge on a given topic or based on research questions, an approach that has previously been used mostly in health sciences although it has started receiving significant attention within the climate science community (Grant and Booth, 2009; Epule et al., 2017; Okpara et al., 2018).

Sectoral documents were systematically analyzed through "keyword searches" to identify and isolate texts indicating specific climate-related problems and adaption actions. Keywords used include: 'climate/climatic change adaptation', 'drought', 'flood', 'mitigation' 'environmental protection', 'environmental education', and 'climate change communication'. Keyword searches led to detailed reading of selected documents to identify relevant details dealing with policy provisions, including the range of initiatives and action plans proposed. A total of 30 policy documents including the National Adaptation Plan of Action (NAPA) and the Growth and Employment Strategic Paper were included in the review (Table 1). In total three documents were available from the water sector; one from the agricultural sector; three from the forestry sector and five from the energy sector were reviewed. NAPA was used to identify the specific adaptation actions each sector should focus on. Considering that mainstreaming climate adaptation cannot occur in a vacuum, policy documents that facilitate the mainstreaming of climate adaptation either directly or indirectly were also consulted targeting specifically to understand; (i) how the government organizational structure has been re-configured to accommodate climate change and environmental protection; (ii) how information related to climate change is disseminated to the general public; (iii) how new academic departments have been created and educational curriculum re-adapted to accommodate climate change and environmental education; and (iv) how climate change adaptation is funded and the various constraints involved. In fact the role of institutions and their configuration, information dissemination and education in enhancing climate adaptation cannot be overemphasized.

To provide additional information not captured in the selected documents, analysis was complemented by semi-structured interviews with stakeholders working in different capacities (13 government officials, 4 academics, 4 NGO experts, 2 civil society actors and 4 experts working with international organizations) (Table 2). To identify potential interviewees, a broad inventory of institutions responsible for mainstreaming climate adaptation/mitigation into sectoral policies either directly or indirectly was carried out using two criteria; (a) function; and (b) knowledge and abilities. The function criterion refers to institutions that are formally responsible for climate change issues and include government departments that prepare policy, legal and regulatory documents in the area of environment and climate change. The knowledge and abilities criterion refers to institutions that have relevant knowledge and skills related to climate change. Contacts were established between the researcher and permanent secretaries in the identified ministries/institutions. The permanent secretaries then established links between the researcher and the different directors and staff in the ministries/institutions responsible for mainstreaming climate adaptation policies in the different sectors considered in this paper. The same approach was used to establish links between the researcher and staff working with international organizations by first contacting the head of each organization; while the lecturers interviewed during the study were contacted directly by the researcher. A snowball sampling technique (Atkinson and Flint, 2001) was also employed to identify other interviewees.

This study was not aimed at investigating implementation

Table 1
List of documents analysed.

Document Title and type	Sector	Source and year
Forest code 94/01/1994 to lay down forestry, wildlife and fisheries regulations (policy document)	Forestry	MINEP (1996a)
Plan National de Gestion de l'Environnement (policy document)	Environment	MINEP (1996b)
Plan d'Action National de Lutte Contre la Désertification Vol I & II (policy document)	Environment	MINEP (1996c)
Cameroon - Forest and Environment Sector Program Project	Forestry	MINEP (2004)
Stratégie national de communication sur l'adapataton aux changements climatiques (policy document)	Communication	MINEP (2005)
Plan du Dévelopment du secteur Électricité (policy document)	Energy	MINEE (2006)
Strategie de developpement du secteur rural (policy document)	Agriculture	MINADER (2006)
Plan d'action national de gestion integree des ressources en eau (PANGIRE) (policy document)	Water	MINEE (2009)
Decree 2009/410 of 10 December 2009 on the Creation, Organization and Operation of the National Observatory on Climate Change (policy document)	Institutional	MINEPDED (2009)
Cameroon civil protection status report (policy document)	Disaster management	MINATD (2009)
NAPA Projects Database (grey literature)	General	UNFCCC (2009)
Planning for Integrated Water Resources Management and Development in Cameroon (grey literature)	Water	GWP (2010)
Cameroon: Growth and Employment Strategy Paper (GESP) (policy document)	General	IMF (2010)
Supporting integrated and comprehensive approaches to climate change adaptation in Africa – Cameroon (grey literature)	General	UNDP (2010)
Review of current and planned adaptation action: Middle Africa (grey literature)	General	Crawford et al. (2011)
Stratégie national de communication sur l'adapataton aux changements climatiques (policy document)	Communication	MINEPDED (2011)
Loi N° 2011/022 portant régime d'electricite (policy document)	Energy	NA (2011)
Climate Change Financing and Aid Effectiveness Cameroun Case Study (grey literature)	Funding	Norrington-Davies (2011)
Elaboration of a strategy to integrate training on adaptation to climate change within the educational system of Cameroun (policy)	Education	MINEPDED (2012)
Decree No. 103/CAB/PM regarding the creation, organisation and operation of the steering committee for activities to reduce emissions from deforestation, degradation, sustainable management and conservation of forests, REDD+ (policy document)	Institutional	PM (2012)
Knowledge Management Strategy on Climate Change Adaptation for Cameroon (grey literature)	General	Egan (2013)
Readiness Preparation Proposal Cameroon (policy document)	Forest (REDD+)	MINEPDED (2013)
National Energy Efficiency Policy, Strategy and Action Plan in the electricity sector in Cameroon (policy document)	Energy	ARSEL (2014)
Understanding the Impact of Climate Change on Hydropower: The Case of Cameroon (grey literature)	Energy	Grijsen (2014)
Economics of Adaptation, Water Security and Climate Resilient Development in Africa	Water	GWP (2014)
Climate change legislation in Cameroon (grey literature)	General	Nachmany et al. (2015)
Second National Communication on climate change (policy)	General	MINEPDED (2015b)
Plan National d'Adaptation aux Changements Climatiques (policy)	General	MINEPDED (2015a)
Republic of Cameroon Energy Sector Development Project	Energy	ARSEL (2017)

effectiveness of sectoral policies on the ground[1]. The study was limited to Yaoundé the capital of Cameroun which is the seat of government institutions where policies are developed. The interview questions were framed to cover the main issues and sectors under investigation (agriculture and food security, water resources, energy, forestry) and all interviewees were asked the same questions. Among the government officials interviewed, five were selected from the Ministry of Environment, two from the Ministry of Energy and Water Resources, two from the Ministry of Agriculture, two from the Ministry of Forestry, and one each from the Ministry of Scientific Research and the Ministry of Public Contracts (Table 2). The interviews were conducted mostly in English and took place from October 24th to December 23rd 2016 and were audio recorded and later transcribed and coded. The participants interviewed were stakeholders actively involved in climate change issues at different capacities within their respective ministries/institutions and a total of 27 stakeholders were interviewed. (See Table 2 for a complete list of experts and their affiliations).

4. Results

4.1. To what extent has climate adaptation been mainstreamed into sectoral policies?

Cameroun's response to climate change and environmental protection is reflected in the country's national policies and the inclusion of climate adaptation within key development plans (Nachmany et al., 2015). The country developed its first National Adaptation Plan of Action (NAPA) in 2005 which was later updated in 2015 to accommodate new challenges aligning with the socio-economic vision set out in the Growth and Employment Strategic Paper (GESP). The NAPA elaborates the framework directives to guide the future coordination and implementation of adaptation initiatives across different sectors. The revised NAPA published in 2015 takes into account many areas of intervention including: agriculture, fishery, forestry, water, energy, urban infrastructure, tourism, education and scientific research, rural economy, telecommunications, gender and protection of vulnerable populations (MINEPDED, 2015b).

4.1.1. Forestry Sector

In the forestry sector, Cameroun put in place a national policy for sustainable forest management and biodiversity conservation in 1996 (MINEP, 1996a). Under this policy, many protected areas have been created across the country as well as many forest regeneration projects and some three million trees have been planted according to experts in the Ministry of Forestry. Furthermore, as of 2007, the surface area covered by protected areas and forest reserves in Cameroun was about 30% of the 19.631 million hectares of total forest area in the country (Alemagi et al., 2014). Many other protected areas classified as forest reserves, wildlife sanctuaries, national parks and zoos have also been created (Lambi et al., 2012). In fact, it is well recognized that protected areas play a significant role in the mitigation of global climate change through carbon sequestration (Melillo et al., 2015). Apart from climate mitigation, protected areas can also contribute to climate change adaptation by helping reduce the impacts of climate change-induced natural disasters such as floods, landslides, hurricanes, tidal waves and storm surges.

Furthermore, verification and certification in forest exploitation is compulsory in Cameroun and the country has signed the Voluntary Partnership Agreement (VPA) of the European Union's Forest Law Enforcement, Governance and Trade (FLEGT) program and African Forest Law Enforcement and Trade (AFLEG) (Savilaakso et al., 2017; Tegegne et al., 2017). The introduction of forest certification schemes

[1] Policy implementation is considered in this study as a potential area for future research.

Table 2
Summary of Stakeholder's interviewed by institution and type of organization.

Structure	No of participants	Type of organization
Ministry of Environment, Sustainable Development and Protection of Nature	5	Government
Ministry of Energy and Water Resources	2	Government
Ministry of Agriculture and Rural Development	2	Government
Ministry of Forestry and Wildlife	2	Government
Ministry of Public Contracts	1	Government
Ministry of Scientific Research	1	Government
Universities	4	Academia
Commission des Forêts d'Afrique Centrale (COMIFAC)	2	NGO
Media	1	Civil Society
Independent Consultant	1	Civil Society
Centre for International Forestry Research (CIFOR)	2	NGO
German Technical Cooperation (GIZ)	2	IO
International Union for Conservation of Nature (IUCN)	2	IO

ARSEL: Electricity Sector Regulatory Agency.
ESDP: Energy Sector Development Project.
IO: International Organization.
GWP: Global Water Partnership.
NGO: Non-Governmental Organization.
IMF: International Monetary Fund.
MINEPDED: Ministry of Environment, Sustainable Development and Protection of Nature.
MINEE: Ministry of Energy and Water Resources.
MINADER: Ministry of Agriculture and Rural Development.
MINATD: Ministry of Territorial Administration and Decentralization.
MINFOF: Ministry of Forestry and Wildlife.
NA: National Assembly.
PM: Prime Minister.
RC: Republic of Cameroun.
UNDP: United Nation Development Program.

has led to positive changes in management practices and increased social and environmental performance potential and could contribute to the sustainable management of forest resources in Central Africa (Atyi et al., 2013). It is reported that through such innovations in governance and cooperative action among multiple stakeholders, the rate of deforestation have been reduced while at the same time allowing continued economic growth (Chow et al., 2013). Hence, protected areas help in climate change adaptation by simultaneously reducing poverty, protecting biodiversity and ecosystems services, and removing atmospheric greenhouse gases (Scarano, 2017).

Cameroon is a member of two multilateral REDD + initiatives: the Forest Carbon Partnership Facility (FCPF) of the World Bank and the UN's Collaborative Programme on Reducing Emissions from Deforestation and forest Degradation in developing countries (UN–REDD) and through such initiatives, several REDD + projects are at the development or implementation stage in Cameroon (Tegegne et al., 2017).

Therefore, by putting in place a national policy for sustainable forest management, creating many protected areas, signing the VPA, FLEGT and AFLEG cooperative agreements and joining several multilateral initiatives such as REDD +, the government of Cameroun has directly or indirectly mainstreamed climate adaptation into the forestry sectoral policies. Through such initiatives, Cameroun has contributed to significantly reduce the rate of illegal logging and deforestation and contributed to sequester significant amounts of carbon which are efforts aimed at mitigating global climate change using forest conservation.

Other actions that indicate adaptation mainstreaming in this sector include the "Operation Green Sahel" that was launched in 1980 as a strategy to stop the advancement of the desert, prevent and reduce soil degradation in arid and semi-arid areas and restore degraded lands. Although this initiative was stopped due to economic crisis, it was relaunched in 2008 and aims to plant more than 10 million trees across the country (MINEP, 2004). This initiative is considered by government officials as part of Cameroun's contribution to mitigate climate change and is fully funded by the Public Investment budget since 2008 (MINEPDED, 2015b).

Other forest related policies that draw from the National Adaptation Plan of Action include; (i) the putting in place of a forest fire monitoring, prevention and early warning system; (ii) increase scientific research activities to characterize the positive and negative effects of climate change on forest ecosystems; (iii) support and reinforce the implementation of REDD + initiatives by involving the local communities; and (iv) develop social indicators to monitor the well-being of the population living around protected areas.

At the sub regional level Cameroun is a founding member of the Forestry Commission of Central Africa (COMIFAC), member of the Congo Basin Forest Partnership (CBFP), and the Conservation and Rational use of Central Africa Forest Ecosystems (ECOFAC) (MINEP, 2004). The different initiatives indicate that Cameroun has made significant progress aimed at mainstreaming climate adaptation/mitigation in the forest sector.

4.1.2. Energy Sector

The country focus in this sector is mainly on the development and modernization of the energy sector. The main climate adaptation policy mainstreamed in the energy sector revolves around the promotion of the use of renewable energy and enhancing energy efficiency in the country; and to also facilitate the use of renewable energy within the context of expanding rural electrification (ARSEL, 2014). Under this policy, several rural electrification projects using renewable energy sources have been executed in the country (Kenfack et al., 2016). Since the 2012 financial year, the importation of solar or wind energy installation and operating equipment are exempted from value added tax (ARSEL, 2014). This policy is intended to encourage the importation of renewable energy equipment as part of the national energy policy and strategic action plan aimed at increasing the resilience of Cameroun's energy sector to climate change and variability (MINEE, 2006). Renewable energy can enhance climate change adaptation by providing energy to power early warning systems, telecommunication systems, health clinics and portable water systems in rural areas (Ley, 2017).

Other policies in the energy sector are articulated in NAPA and include; (i) diversification of energy sources in the context of climate change; (ii) construction of new hydropower dams and rehabilitation of existing ones; (iii) encourage the use of renewable energy and enhancing energy conservation through new technologies. In fact, the role of hydropower production in mitigating greenhouse gas emissions cannot be overemphasized, which can explain why many hydropower projects are under execution in Cameroun including; Lom-Pangar dam, Mvele hydro-power project, Mekin hydro-power project, Bini à Warak hydropower project, and Ngodi hydro-power (MINEE, 2015; ARSEL, 2017). This vision is also outlined in the GESP in accordance with the recommendation of the World Bank. The strategy is to stimulate the development of hydropower to lower electricity cost, reduce carbon emissions and insulate sub-Saharan African countries from increases in the price of fossil fuels (World Bank, 2009). Such policy initiatives are also geared towards reducing the country's carbon footprint through the use of renewable energy (World Bank, 2009). Hydropower dams reduce the impacts of climate change on water resources because regulated basins with large reservoirs are more resilient to water resources changes, less vulnerable to climate change and also act as storage buffer against climate change (Berga, 2016).

In the area of biomass consumption, Cameroun is engaged in a process to freely distribute improved fuel-efficient cooking stoves to local communities to reduce pressure on the cutting down of trees for firewood (MINEE, 2015). This project is financed by Carbon revenues

and is facilitated in the country by CO2balance and the African Centre for Renewable Energy and Sustainable Technology (ACREST) (Muthiah, 2014). Such initiatives also enhance climate change adaptation by simultaneously reducing poverty, protecting biodiversity and ecosystems services, and removing atmospheric greenhouse gases (Scarano, 2017). Our analysis show that substantial progress has been made to mainstream climate change adaption in the energy sector in Cameroun.

4.1.3. Water sector

The law governing the water sector adopted in 1998 recognizes water as a national good that is not infinite and needs to be protected and managed efficiently. In the absence of a national water policy in Cameroun, integrated water resources management (IWRM) is recognized as a starting point to mainstream policies on the sustainable management of water resources under a changing climate (MINEE, 2009). The vision in the IWRM action plan is to; (i) make water accessible to all citizens; (ii) preserve natural ecosystems which are dependent on water; (iii) increase agricultural production and reduce food insecurity through the efficient management of water resources (MINEE, 2009; GWP, 2010).

However, to improve the sustainable management of water resources in a changing climate, the goals set out in NAPA that mainstream climate adaptation in the water sector include; (i) reduce socio-economic vulnerability to climate change through the rational management of water resources; (ii) reduce the exposure of the population to health risk posed by climate change by upgrading urban drainage infrastructure; (iii) continue to collect relevant hydro-meteorological data that can enhance research and pursue capacity building in research institutions to understand the occurrence of extreme events and how they can be predicted in real time; (iv) continue to fight against desertification and develop water harvesting infrastructure in arid areas; (v) put in place an early warning and health surveillance system for water borne diseases; (vi) reinforce the treatment and prevention of water-related diseases that may become recurrent as a result of climate change.

At the regional level, Cameroun has adhered to numerous policies, strategies and plans that promote the mainstreaming of climate adaptation in the development and management of water resources including; United Nations Framework Convention on Climate Change (UNFCCC), African Water Vision, African Union Sharm el-Sheikh Declaration on water and sanitation, strategic framework for water security and climate resilient development, regional water policy of Economic Community of Central African States, the financing strategy for the water sector in Central Africa, the 2025 development vision of the Lake Chad Basin Commission (LCBC), the Lake Chad Basin Strategic Action Program, the Congo-Oubangui-Sangha River Basin Strategic Action Plan. The Government of Cameroun has also adhered to numerous international agreements in the area of water security and climate resilient development all aimed at mainstreaming climate adaptation in the water sector (GWP, 2014). Yet, adaptation has not been mainstreamed in this sector due to numerous constrains enumerated in Section 4.2 below.

4.1.4. Agricultural sector

A national strategy for the development of agricultural sector was put in place in 2006. Although mainstreaming climate adaptation is not explicitly considered in that policy document, the main goals in the strategic plan that are relevant to climate adaptation include; (i) to develop a sustainable agriculture and food supply system; (ii) enhance the sustainable management of natural resources; (iii) develop adapted financial mechanisms in the sector; (iii) manage the risk of food insecurity; and (iv) develop an adapted institutional framework for the agricultural sector.

Through NAPA, Cameroun intends to mainstream climate adaptation in the agricultural sector to make its agricultural system resilient to climate change and improve the adaptive capacities of the various actors in this sector. To achieve these goals, the following policies are envisaged to be mainstreamed in the farming sub-sector; (i) provide weather and climate information services to rural communities through community radios to help farmers plan farming activities; (ii) improve farming systems by enhancing agronomic research and put in place a national strategy to disseminate research results; (iii) promote adaptation process through the use of improved crop varieties, improve soil management for nutrient and water conservation and promote the use of fertilizer to increase yields; (iv) agricultural diversification to reduce vulnerability by promoting agroforestry in the different agro-ecological zones; (v) free distribution of farm inputs to smallholder farmers; and (vi) update the land tenure policy to address gender imbalance to ensure that women can easily access land for agricultural purposes.

In the agro-pastoral sub-sector; (i) provide weather and climate information services to pastoralists using community radios; (ii) rehabilitate existing weather stations to observe the evolution of climate and its impact on livestock; (iii) develop community water points for cattle and put in place village committees to manage these water points; and (v) develop an agro-pastoral policy that takes into account climate adaptation.

In the fishery sub-sector; (i) provide weather and climate information services to the fishermen using community radios; (ii) improve the management of fishing and aquaculture activities around dams to improve the exploitation of different fish species to avoid scarcity; and (iii) promote the creation of community fish ponds and develop new techniques to improve the treatment, drying and conservation of fishery products. All these initiatives are aimed at enhancing adaptation to climate change and show that country has good intentions to mainstream climate change adaptation in the agricultural sector.

4.2. What are the constraints impeding adaptation mainstreaming?

Notwithstanding the substantial that have been made by Cameroun to mainstream climate adaptation into sectoral policies, majority of the stakeholders interviewed recognised that there are still numerous challenges that impede the mainstreaming initiative in the country. Generally, information about the impacts of climate change is not easily accessible from the general public. Analysis revealed also that collaboration among government institutions, NGOs and the local communities is very limited (UNDP, 2010).

In the area of communication, the government recognizes that despite many communication channels put in place, climate information is generally insufficient especially at the regional and local levels and not well coordinated given that local authorities are not well informed (MINEPDED, 2015b). Brown and Sonwa (2015) also reported that, there is lack of information on climate change adaptation among government officials working at the regional and sub-regional level thus limiting their capacity to help the local communities to gain access to climate information. This lack of information by the general public has been attributed to a lack of government policy to enhance the dissemination of climate information to the general public (Egan, 2013). For example one stakeholder lamented that many websites created to provide information to the general public are not regularly updated and access to internet is still very low and costly. Furthermore, lack of logistical support, insufficient information and training among journalists discourage private media organs from reporting issues related to climate change (Tiani et al., 2015).

Even with the existence of relevant academic departments in some universities in the country, during the interviews, many stakeholders were frustrated that most climate impact research is conducted in foreign institutions. They lamented that although such research may be recognized globally because it is published in peer reviewed journals, it may lack policy uptake because it may fail to address priority areas pertinent to policy makers in Cameroun. Stakeholders in the academia also expressed frustration on the lack of resources and relevant climate data needed to carryout impact studies. They also decried the absence

of collaboration between scientists and policy makers.

Even though the government has elaborated a national strategy to integrate courses/modules and training programmes on climate change into formal educational systems, environmental education is absent in the curriculum of teachers training colleges in Cameroun (MINEPDED, 2012). Consequently, teachers lack the capabilities to train pupils/students in the area of climate change. A similar situation has been observed in journalism training schools which limits the capacity of journalists to report relevant climate issues (Tiani et al., 2015).

Although the country is well placed to harness available adaptation funding, a co-ordinated climate change adaptation strategy is needed to ensure that sovereign development projects and climate adaptation projects are not conflated and therefore render ineligible for their separate respective funding streams (Egan, 2013).

Some stakeholders were of the opinion that, the fragmented nature of institutions involve in climate issues sometimes creates instances of overlap and misinterpretation of rules by different institutions resulting to conflict and power struggle among stakeholders. According to them, such situations could lead to a delay in the execution of pilot projects put in place to facilitate climate adaptation mainstreaming into sectoral policies.

Most stakeholders in government ministries decried the absence of resources including basic working materials such as computers, absence of sufficiently trained personnel and financial resources.

What steps have been put in place to address inherent constraints aimed at facilitating climate adaptation mainstreaming across different sectors?

4.2.1. Institutional reforms

Generally, institutions and their configurations play an important role in mainstreaming government policies (Koetz et al., 2012). In the area of climate adaptation, previous research has shown that institutional arrangement can significantly facilitate the mainstreaming of climate adaptation into sectoral policies (Mubaya and Mafongoya, 2017). Considering this, efforts by the government of Cameroun to include climate change into major policy agendas began in 1994 after ratifying the UNFCCC by creating the Ministry of Environment and Forestry. This ministry was later split into two to create the Ministry of Forestry (MINFOF) and the Ministry of Environment and Nature Protection (MINEP) in 2005, later renamed Ministry of Environment, Nature Conservation and Sustainable Development (MINEPDED) in 2011. This ministry is responsible for multi-sectoral policy development and implementation in the areas of climate change and environmental protection. Presidential decree N° 2009/410 created and organized the National Observatory on Climate Change. The observatory is responsible for directing climate change impact studies, adaptation research, policy advice, information sharing, and to support national capacity development in this area.

Other institutions that support climate change adaptation/mitigation include the creation, organization and functioning of the Steering Committee to reduce emissions from deforestation, forest degradation, sustainable management and conservation of forest (REDD +) by decree N° 103/CAB/PM. The Committee is responsible for the formulation of proposals for REDD + strategic action plans, develop selection criteria for REDD + projects, evaluate REDD + pilot project proposals, promote REDD + activities and validate the work of the National Technical Secretariat. In compliance with UNFCCC recommendation, the “Cellule National des Changement Climatiques” (CNCC) was created in the MINEPDED. The goals of CNCC include the creation of a greenhouse gas (GHG) inventory, establishing adaptation measures, implementing an information system and database, designing sectoral projects addressing priority climate actions and evaluating climate change impacts and policies (Nachmany et al., 2015).

4.2.2. Information dissemination

Under international binding treaties, Cameroun was not expected to prepare a NAPA (UNDP, 2010) as it is not on the list of Least Developed countries (LDCs) but the country opted to do so in partnership with UNDP. Since 2005, the country has prepared and adopted three National Communications (NCs) on Climate Change (MINEPDED, 2015b).

According to the stakeholders interviewed, the government of Cameroun and her partners acknowledge that the media can influence the perception and attitude of the general public regarding environmental issues especially climate change and as such, many communication channels have been created for this purpose. Dedicated media organs such as Radio Environment was created by the World Conservation Union in Yaoundé in partnership with the government although it does not cover the whole country. Another stakeholder articulated that a network of community radios have been created across the country through the help of UNESCO to facilitate the broadcast of climate information in local languages. Furthermore, UNESCO organizes regular training sessions for local journalists managing these community radio to train them on how to produce and broadcast climate information. Other communication channels that have been put in place to facilitate access to climate information include; (i) monthly magazine and weekly newsletter of MINFOF; and (ii) many weekly and bi-monthly programs run by Cameroon Radio Television (CRTV) (UNDP, 2010).

4.2.3. Education and training

The government of Cameroun in partnership with UNDP, has elaborated a national strategy to integrate courses/modules and training programmes on climate adaptation and environmental protection into the formal educational systems (primary, secondary and tertiary) (MINEPDED, 2012). According stakeholders at the Ministry of Environment, the elaboration of this strategic policy document ushered in the inclusion of environmental education into the national education curriculum. Since the adoption of this policy, environmental education has become a regular subject taught in primary and secondary schools across the country (Nchia et al., 2017). Many stakeholders interviewed were unanimous that there was a functional department of Hydrology and Climatology at the University of Maroua, a laboratory of environmental modelling and atmospheric physics hosted by the Physics department in the University of Yaoundé I and a faculty of agronomy and agriculture sciences in the university of Dschang where research on climate change impacts and adaptation are conducted to enhance the mainstreaming initiative.

4.2.4. Adaptation financing

Scientific analyses have emphasize the significant financial resources and technological support needed to address Africa’s current adaptation deficit (Niang et al., 2014). As part of the engagement to fulfil this obligation, multiple climate adaptation projects are currently under execution in Cameroun with most projects aimed at facilitating the mainstreaming of climate adaptation into different sectoral policies (UNDP, 2010). Other projects are in the areas of forest, energy, mangroves, watershed management and developing climate scenarios (Crawford et al., 2011).

Examples of projects that have been executed in Cameroun include; (i) the Africa Adaptation Project and the objective was to strengthen institutional capacities, enhance existing experiences so that climate adaption could easily be mainstreamed into different sectoral policies and was funded by the Japan International Cooperation Agency (JICA); (ii) the Africa Adapt Knowledge Sharing Innovation project which was aimed at strengthening the adaptive capacities of small farming communities jointly funded by the Department for International Development (DFID) and the Natural Environment Research Council (NERC) United Kingdom; and (iii) the Climate Change Adaptation in Africa (CCAA) programme which was aimed at establishing a program on vulnerability and adaptation to climate change in Africa and was co-financed by the International Development Research Centre (IDRC) and the DFID-UK. As a member of the Lake Chad Basin Commission (LCBC),

Cameroun has also benefitted from another project entitled "Lake Chad Sustainable Development and Support Program" financed by the Africa Development Bank. Since the approval of Cameroun's REDD + Readiness Plan (RPP) in 2013, it has benefitted from a readiness grant of USD3.6 million since 2013 (Nachmany et al., 2015).

4.3. Stakeholders' recommendations

Despite the difficulties expressed by stakeholders that hinder the mainstreaming of climate adaptation into the water, agriculture, energy and forestry sectoral policies, proposals were made that according them can fast-track the mainstreaming process.

In the area of research more than half of the stakeholders interviewed were of the opinion that; while searching for ways to facilitate the mainstreaming of climate adaptation into different sectoral policies, the government should consider the allocation of financial resources to country-based institutions. They argued that such initiatives have the potential to increase the research output from country-based institutions, directly address the needs of the policy makers, increase collaboration between researchers, policy makers, and local communities and could help to upgrade research facilities in the beneficiary institutions and enhance capacity building in those institutions.

Other stakeholders cautioned that policy makers should encourage researchers to carry out long-term climate impact studies which are useful for mainstreaming policies aimed at long-term climate resilient development instead of concentrating on short time frames guided by politics and immediate development priorities; considering that the most severe impacts of climate change may become visible only in the long-term.

Considering the significant deficit in the number of climate scientists in Cameroun, many stakeholders interviewed proposed that; to raise awareness among pupils and students and encourage them to develop interest in climate science, the government in partnership with development partners could put in place a strategy to install simple weather stations in schools across the country. According to them, installing such weather equipment in schools have the potential to arouse curiosity among pupils and students thereby encouraging them to develop interest in climate science which could reduce the deficit in climate scientists in the long term.

To reduce the communication gap and make climate information more accessible to the general public, some stakeholders interviewed proposed that the government and other partners could put in place different categories of monthly/annual prizes to compensate local media organizations and journalists that run regular programmes or report issues on climate change and environmental protection. Stakeholders also proposed that training workshops should be organized with local stakeholders such as parliamentarians, mayors, women group leaders, village leaders and faith leaders who have the capacity to mobilise and influence the local population to train them on climate issues given that this group of people can easily disseminate climate information to the local communities if there are sufficiently informed.

In the area of adaptation financing, stakeholders articulated that since most government ministries/institutions directly involved with climate issues have less financial autonomy to directly mainstream climate adaptation into long-term development plans at different sectoral levels; specialized units could be created in influential ministries responsible for finance and economic planning. They argued that the creation of such units in those influential ministries may fast-track the mainstreaming of climate adaptation into the country's long term development plans. However, it was cautioned that for such plans to be successful, there is need to train more climate scientists to take up such roles in public administration.

5. Conclusions

The main objective of this paper was to examine to what extent climate adaptation has been mainstreamed into the water, agriculture, forestry and energy sectors in the Central Africa sub-region with particular focus on Cameroun. To answer the over-arching research question, the strategy adopted was an in-depth qualitative method involving a systematic review of strategic policy documents published by the Government of Cameroun. This technique was complemented by semi-structured interviews with key stakeholders in relevant government ministries/institutions and organizations working in partnership with Cameroun to enhance the mainstreaming of climate adaptation into sectoral policies.

Results reveal that significant progress has been made in mainstreaming climate adaptation in the forestry and energy sectors facilitated through different national policies, legislation and strategic action plans put in place by the government. In addition, relevant policies have also been complemented by other policy incentives elaborated in the National Adaptation Plan of Action. In the absence of strategic policy documents that mainstream climate adaptation in the water and agricultural sectors, progress has been registered in these sectors through the National Adaptation Plan of Action. However, it is thought that putting in place national policies that take into account climate change impacts in these sectors will facilitate the mainstreaming initiative in these sectors.

Analysis complemented by stakeholder interviews indicate that there are still many obstacles such as the lack of human and financial resources that need to be addressed to enhance climate adaptation mainstreaming especially in the agriculture and water resources sectors.

Although institutions such as the Ministry of Environment, Sustainable Development and Protection of Nature and the National Observatory for Climate Change that have been put in place to facilitate the mainstreaming of climate adaptation into sectoral policies, cross-sectoral coordination is still lacking. However, it is hoped that projects funded by development partners such as REDD + initiatives will allocate part of their funding for capacity building so that experts can take up leadership roles aimed at enhancing cross-sectoral climate adaptation mainstreaming in the country.

Considering that our document analysis showed that most climate adaptation mainstreaming are taking place mostly at the national level, Cameroun needs to implement effective "cross-sectoral" decentralization strategies so that personnel from regional and local institutions can benefit from training and resources from different climate adaptation initiatives.

Many initiatives such as; (i) the putting in place of a national policy for sustainable forest management, (ii) creation of many protected areas, (iii) signing the VPA, FLEGT and AFLEG cooperative agreements and (iv) joining several multilateral initiatives such as REDD + in the forest sector; and (i) promoting the use of renewable energy and the putting in place of a national policy to enhance energy efficiency, (ii) the construction of many dams for hydro-power generation in the energy sector and other sectoral policies elaborated in the National Adaptation Plan of Action; indicate that mainstreaming climate adaptation into sectoral policies is effective in Cameroun. Such initiatives are relevant to other countries in the Central Africa sub-region especially those pursuing sectoral climate adaptation mainstreaming initiatives.

Overall, this paper presents valuable insights on important policy and institutions advances that have been put in place by Cameroun to facilitate and sustain climate adaptation mainstreaming into sectoral policies as a response to climate impacts and also in compliance with international bilateral agreements signed under the United Nations Framework Convention on Climate Change.

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